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THE INITIAL RESPONSE OF THE UNITED STATES' TEXTILE RECYCLING INDUSTRY TO THE COVID-19 PANDEMIC

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BY

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ABSTRACT

The fashion industry is cited as a major contributor to global pollution. The urgent need for a reversal of climate change has led the textile and apparel industry to assess what opportunities exist to convert to greener, less damaging solutions. The recycling of existing textiles and textile waste into yarns and fabrics would reduce the need for raw materials as well as divert millions of tons of textile waste from landfill. Just as these advancements are being made and consumers are beginning to invest in more responsible textile products, the COVID-19 pandemic occurs, and global markets come to a halt. Shoppers continue to express interest in sustainable fashion, but is the textile recycling industry equipped and able to move forward?

The goal of this research is to assess the textile recycling industry in the United States amid the COVID-19 pandemic. Nine such organizations and their pandemic experiences are investigated using a case study approach. Each business responded to a survey which was then coded using thematic analysis and content analysis. The resulting data was examined through the lens of a COVID-19 pandemic-based conceptual framework, the Enterprise Effectiveness and Sustainability Model. The study found that company structure, company culture, supply chain, leadership, virtuality, and finances were all important variables in organizational resilience during the pandemic. Results show that domestic textile recycling organizations suffered the greatest impacts through their supply chain, decreased internal productivity, and financial hardship caused by lessened demand and workforce availability.

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CHAPTER 1

INTRODUCTION

The COVID-19 pandemic is undoubtedly a defining moment for the global population. Seemingly overnight our possessions, occupations, and behaviors were reduced to that which is essential. An inability to frivolously leave home forced people to make do with what they had and reconsider the items they value. Regardless of environmental or societal effects, we began thinking about the sustainability of our things. The cultural expectation for overconsumption of clothes left us with closets full of apparel and accessories that, much like us, no longer had a place to go. What previously began as a climate change fueled mission to improve the longevity and impact of our clothes, became a purposeful reconsideration of why and how the consumption of textile products can be more responsible.

Both consumers and producers are redirecting their core beliefs and supply chains to incorporate sustainability. These initial changes are primarily environmental though sustainability also includes social responsibility and economic viability. Alongside this mindset shift, mass consumption and fast fashion continue to trend online. Individuals took to social media throughout the pandemic to show off their online shopping sprees from companies who produce cheap garments from underpaid labor in overcrowded factories in Asian countries. How can consumers be to blame? Many lost jobs and income during the pandemic and no longer have the expendable income to buy into

newer and more sustainable fashion, yet they are decluttering closets and throwing millions of garments into charity and garbage bins.

According to the United States Environmental Protection Agency (2020), more than 17 million tons of textile waste was generated in the year 2018. Less than 15% of such was reported as recycled, almost 19% incinerated, and still more than 11 million tons were deposited in landfills. This fiber and textile waste is eligible for recycling and reuse, however, we are sorely lacking the infrastructure to do so.

Most domestic textile recycling organizations collect and redistribute discarded garments. While these are sold among local second hand markets, it's more likely they are baled up and sent overseas to supplement foreign economies. A smaller, growing subset of textile recycling companies are focused on the reuse of what would otherwise be classified as waste. These organizations sort and shred textiles down to their fiber form, in some cases chemically, to be respun into new yarns.

This research examines how textile recycling organizations are being impacted by the COVID-19 pandemic. If sustainable fashion is increasing in demand, are these companies ready to scale? The ability to remain resilient and productive throughout an otherwise paralyzing pandemic is important, and this study investigates the areas of their business that they were able to maintain, and those that may require improvement. Obviously, the trauma of the pandemic is not over so more changes and adjustments are predicted to come. This research serves as a snapshot in time, or a progress report on these organizations.

A case study approach was employed to examine survey responses from nine textile recycling enterprises in the United States. Through thematic and content

analysis, conclusions were made as to how textile recycling is being impacted. Select themes were drawn from a framework proposed in 2020 advising enterprises how best to remain economically sustainable during the COVID-19 pandemic.

CHAPTER 2

REVIEW OF LITERATURE

Sustainability in the Fashion Industry

The fashion industry is at the outset of a sustainable makeover (Roshitsh, 2020a; Wang, 2017; Zarghani, 2020). Designers and brands are transitioning to greener supply chains in hopes of increasing the longevity of a habitable climate on Earth, and, perhaps more importantly, appealing to the increased consumer demand for consciously-created products (Bide, 2020; Ford, 2020; Luu, 2021; Salibian, 2020). This interest in a green textile and apparel supply chain has been important for 20 years, but only recently has it become a key conversation among companies and consumers (Bide, 2020; Chi, 2021). Alongside food, housing, and transportation, textiles and apparel create significant negative environmental effects, with the fashion industry solely responsible for about 4 percent of annual global carbon emissions, measuring out at 2.1 billion tons (Fashion on Climate, 2021; Leal Filho, 2019; Roshitsh, 2020d). These ramifications are the most severe at the beginning of the life cycle (material, yarn, and fabric preparation account for 52% of carbon emissions), however, a reconsideration of raw and virgin materials could significantly reduce these impacts (Fashion on Climate, 2021; Leal Filho, 2019; Roshitsh, 2020b).

In exploring the opportunities in a sustainable fashion supply chain, Ho (2012) use the “five Rs” which are: recycling, reusing, reducing, re-designing, and

reimagining of apparel and textiles (Brydges, 2020a). This research specifically addresses recycling and its burgeoning industry.

Textile Recycling

The idyllic allure of fashion causes consumption, and with consumption comes garbage (Rogers, 2009). The promotion and purchase of items is driven by a flux in trends, all of which will come to an end, so apparel design and profit relies on the planned obsolescence of garments and styles (Piribauer, 2019). Over the last 50 years this supply chain has been built effectively, yet in a linear fashion as products typically have no other fate than landfill; even the most loved and secondhand garments are one day rendered unwearable (Bide, 2020; Chi, 2021; Keh, 2021).

A sustainable future is impossible without addressing fashion's trash (Bide, 2020). Fibers are the basis of textiles, and 73% of the 53 million tons of fibers produced annually end up in landfill (Ford, 2020). Nonetheless, world fiber production increases each year (Piribauer, 2019). According to the United States Environmental Protection Agency (EPA), clothing and home textiles account for most of the collected and measured textile waste in municipal solid waste (MSW; EPA, 2020; Piribauer, 2019). MSW is the categorization of trash generated within a community and includes discarded goods, organic and inorganic debris like food scraps, yard trimmings, and hazardous waste, construction debris and packaging (Beede, 1995). MSW does not include commercial waste (e.g., industrial, agricultural; Beede, 1995). Commercial waste is solid waste generated during business operations, for example, that which is discarded by stores, markets, offices, restaurants and other non-manufacturing activities (Law Insider, 2021). In 2018 the United States generated 17 million tons of

textile waste, 5.8% of the year's total MSW, and reported only 15% of these textiles as recycled (EPA, 2018). It's important to note that the above measured textile waste is only MSW and does not account for commercial textile waste, which is estimated to be upwards of 40 times more than MSW in New York City alone (McCarty, 2021).

Not only is it damaging for textiles to sit in landfills, but it is expensive; in 2017 it cost $3.7 billion to landfill textile waste (RRS, 2020). Further, the textile waste stream increased almost 80% between the years 2000 and 2017, and during that growth, the recycling rate remained steady around 15% (RRS, 2020).

Despite the high volumes being sent to landfill, fibers are valuable, and all textiles and clothing are eligible for recycling (Ford, 2020; LeBlanc, 2020; Luu, 2021). Tackling the fiber waste problem is being touted at the "next frontier" for cities hoping to reduce their solid waste and a well-organized system of recovery is imperative to improve the associated environmental impacts (Cuc, 2014; LeBlanc, 2020).

Textile recycling can be accomplished in a few different ways. Chemical, mechanical, and thermal processing recycle textiles based upon the level of disassembly, which can be as simple as fabric recovery or as exact as fiber, polymer, or monomer extraction (Leal Filho, 2019). Mechanical shredding of wool fibers has been accomplished for centuries, as they are long enough to survive the process in sufficient quality to produce acceptable recycled fabrics. Mechanical fiber recovery is rough on the fibers and oftentimes called downcycling (Bide, 2020). Downcycling is the term given to recycling processes that reduce the quality of a material (Kirchherr, 2017). Wool, however, is resilient enough to withstand this process and produce a

recycled fiber viable for reuse (Bide, 2020; Furferi, 2008). The chemical recycling of polyester and PET (the world's most-used fiber as of 2020) reduces fossil fuel consumption because polyester is a petroleum-based fiber (Donaldson, 2020; Jaffe, 2020; Keh, 2021).

The recycled fiber products of mechanical processing are used for filling materials in insulation, nonwovens, and recycled yarns; yarns which can then be woven or knit into new textiles and clothing (Leal Filho, 2019).

Obstacles in Contemporary Recycling

There exist limitations in fabric collection and sorting technology, among overall lack of infrastructure in the United States (Brooks, 2018; Hawley, 2006). As textile waste increases, the waste stream grows more complex (Bide, 2020). From the public perspective, there, too, is a lack of information, awareness, and participation, accompanied by non-existent or weak legislative policies (Leal Filho, 2019).

Following collection of pre- and post-consumer waste, the most significant barrier to textile recycling remains the need to sort according to fiber (Bide, 2020; Brooks, 2018; Ford, 2020; Keh, 2021; Piribauer, 2019). This challenge is exacerbated by the fact that many textile products today are made of fiber blends (e.g., cotton/polyester, spandex/polyester, wool/acrylic; Piribauer, 2019). In the current textile recycling industry this sorting is done by human hand which is time-consuming and overall costly (Billie, 2021; Brooks, 2018) Many garments that end up in the recycling system are unlabeled, meaning a lack of clear information on fiber type or fabric finish (e.g., waterproofing; Brooks, 2018). This renders the textile un-recyclable, as specific fibers warrant specific recycling methods (Brooks, 2018; Keh,

2021). For example, spandex is unfit for mechanical shredding, as the fiber melts into the machinery at high operation temperatures (Langley, 2000; Wang, 2006). Eligible recycled fiber blends are commonly repurposed into nonwovens, falling again into the category of downcycling (Bide, 2020).

In addition to sorting textiles by fiber type, trims and hardware must be removed from garments, so as not to get stuck in or impede upon the fiber recycling process (Leal Filho, 2019). This is especially challenging with metal trims like zippers, snaps, and buttons, which would get trapped in and be harmful to the recycling machinery. This removal is primarily done by humans which is costly (Billie, 2021).

An overwhelming concern among climate activists is that the normalization of textile recycling will come too late to positively benefit the environmental crisis (Keh, 2021). Recycling of fibers and textiles is important because material that already exists can replace the need for new production of materials, which lightens the environmental load presently weighing down the planet (Zamani, 2014). Over the past thirty years the paper recycling industry has grown from infancy to a universal standard, where the materials used to make boxes and paper are not new; this same model is being used to build textile recycling so that in another thirty years' time we'll have normalcy in textile waste management, too (Notman, 2020).

Unfortunately, recycling is not the only solution to fashion's trash problem; even the most perfect circular textile system will continue to perpetuate the current consumerist mindset which allows manufacturers to proceed with the make-use-dispose model (Bide, 2020; Brooks, 2018).

Circular Economy

Sustainability in textiles, specifically, textile recycling for the reuse and regeneration of fibers and fabrics are all a part of a push for a *circular economy* (Leal Filho, 2019). The concept of circular economy has been pertinent since the late 1970s, and it is attributed, in part, to Boulding's (1966) idea of the Earth as a single closed-loop biosphere where the economy and environment should operate in similarly (Geissdoerfer, 2017). No doubt a complex concept, a circular economy relies on the idea that materials are endlessly useful and, in large-scale industrial application, this sort of operation would affect waste management, improve job creation, make better use of resources, shift design processes, and realign societal material value (Geissdoerfer, 2017; Lyle, 1996; Reday, 1976). This large-scale shift is more than industrial, it requires an entire socio-cultural change (Brooks, 2018).

The responsibility "to be better" is commonly laid onto consumers, who are led to feel guilty for succumbing to the endless desire of capitalist culture (Rogers, 2009). Extended Producer Responsibility (EPR) is an economic theory that reverses that mindset, suggesting that companies and producers should be aware of and held responsible for the end-of-life of their goods (Walls, 2006). The introduction of EPR into fashion has prompted the rise in take-back programs seen at retailers like H&M, Madewell, Patagonia, and Levi's (Childress, 2020; Holdefehr, 2018; Walls, 2006; Willson, 2021). EPR is also meant to encourage designers to make systemic changes such as implementing waste-free patterns and improving product recyclability (Walls, 2006).

There are other companies (e.g., Girlfriend Collective, MUD Jeans) working to incorporate circularity into their business, and ideally, achieve a completely closed-loop supply chain in the long term (Ho, 2012; Spencer, 2020). Textile recycling alone is poised as one of the critical factors in this transition because of the focus on proper management of the waste stream due to the increased annual disposal of textiles (EPA, 2018; Leal Filho, 2019; Piribauer, 2019). Author Liz Ricketts said that in shifting economic models for the entirety of the fashion supply chain "...the end of the line is the beginning of the circle." (Roshitsh, 2021 para. 19)

Financial Viability

The stripping of consumerism and overconsumption from the current cultural mindset is challenging, however, textile recycling can be immediately enticing in that there is proven economic benefit to widespread implementation (Cuc, 2014; Ford, 2020). For designers and brands, being able to boast about sustainable changes increases interest and sales (Rogers, 2009). The importance of financial investment into scaling the textile recycling infrastructure cannot be understated (Ford, 2020).

These initiatives are gaining traction and backing in the United States. In January of 2021, Massachusetts Institute of Technology (MIT) launched their Climate and Sustainability Consortium where companies will collaborate across industries to meet and exceed climate goals (Loturco, 2021). Companies involved at the time of launch include giants like Apple, Boeing, IBM, and Intidex, the Spain-based fashion conglomerate that owns Zara (Loturco, 2021). In the same month, the Walmart Foundation funded a $1.2 million research grant towards Accelerating Circularity to explore the management of textile waste and implementation of circular textile

systems on the East Coast (Mowbray, 2021). The Accelerating Circularity project is similarly funded by Gap, Inc., Target, and VF Corporation (Accelerating Circularity, 2020).

In addition to organizational profit, the charge for textile recycling is primarily being led by small-scale organizations (LeBlanc, 2020). This means that an increase in the industry will positively impact small and family businesses, as well as create opportunities for employment at every phase (e.g., collection, sorting, transport; Cuc and Vidovic, 2011; Zamani, 2014). Presently, the United States textile recycling industry provides more than 17,000 jobs at over 500 companies (LeBlanc, 2020).

Overall, the culmination of issues created by decades of unsustainable manufacturing and waste management has led to Earth's environmental deterioration and alone has become a global issue of "pandemic proportions" (Luu, 2021, p. 1).

COVID-19 and Society

Amid the global climate crisis, a viral pandemic began late in the year 2019 from a particularly contagious and novel strain of coronavirus, COVID-19 (Sohrabi, 2020). The impacts of this unprecedented global pandemic were felt in every single country and industry across the globe (Ahmed, 2020). These shock waves, in some cases, are leading to a better future as individuals and corporations alike are being forced to reflect upon and realign their values. This traumatic public health emergency has simultaneously led to reconsideration and downsizing of our economy parallel to shifts in consumer behavior (Ahmed, 2020; Cohen, 2020). Social scientists recognize that catastrophes of this caliber often give way to long-term social change, in this case, focusing on the reduction of materialistic lifestyles that are solely based on energy

consumption (Cohen, 2020). At the time of this writing, the vaccine rollout has only begun, and new strains and mutations of the virus are being discovered and transmitted globally. The world is not at the end of this disaster and the ultimate duration and impact remains unknown (Amed, 2020).

COVID and Fashion

The impacts of COVID-19 have varied across industries, but the apparel and textile supply chain has become particularly vulnerable to this crisis as it relies largely on discretionary income and a social context for the consumer to go to display the purchase (Amed, 2020; Chakraborty, 2020). According to a report by The Business of Fashion and McKinsey & Company, the impacts of COVID-19 have cost the apparel and textile industry upwards of $2.5 trillion (Amed, 2020). Due to the pandemic, millions of industry employees have lost their jobs (Chakraborty, 2020).

Despite all of the challenges and roadblocks presented by the pandemic, many brands have maintained their commitment to sustainable and circular changes they had made in years prior (Brydges, 2020a; Remington, 2021). Conversations around circularity are being led by academic literature and organizations like the Ellen MacArthur Foundation, Kering Group, LVMH, and Adidas (Brydges, 2020a; Remington, 2021; Spencer, 2020). With a statement in 2020, LVMH executives reiterated their commitment to lessening their environmental impacts and said the pandemic encouraged this recommitment (Spencer, 2020). The Chief Executive Officer at Adidas said the same, adding that they plan to expand upon their range of sustainable products as early as 2021 (Remington, 2021). Following a particularly hard-hit including mass layoffs, Levi Strauss & Co. are aligning their post-pandemic

values away from conspicuous consumption, and towards brand loyalty, trust, and of course, sustainability (Lockwood, 2020). Levi's has upgraded their online buyback and resale program as well as invested in producing denim from fibers recycled from waste (Roshitsh, 2020a; Willson, 2021). These public statements are not representative of the entirety of the industry, as most circular efforts have quieted down (Brydges, 2020a).

COVID-19 has sharpened the focus on fashion's growing textile waste (Brydges, 2020a). Consumers who are now spending significantly more time at home are decluttering and purging unwanted clothes from their closets and are donating these goods to charity organizations (Brydges, 2020a; Ortolan, 2020; Palmer, 2020; Roshitsh, 2020c). It is unknown, at this time, whether this influx of textile waste will boost the secondhand market or will overwhelm these organizations and ultimately end up in landfills (Brydges, 2020b; Ortolan, 2020).

Aside from products already in the hands of consumers, fashion brands struggling in the face of the global crisis chose to cancel orders already mid-production in Asian factories (Brydges, 2020b). Bangladesh alone reported $3 billion worth of inventory in canceled and suspended orders (Roshitsh, 2020c). The halting of works-in-progress not only upended the careers of these already low-income women, but the products themselves became unwanted waste (Brydges, 2020b). In labeling this a humanitarian crisis, new organizations are emerging to assist in the disaster (Brydges, 2020b; Lost Stock, 2021). Lost Stock, based in Edinburgh, Scotland is supporting these overseas garment workers (and mitigating textile waste) by selling these abandoned products to consumers around the world (Lost Stock, 2021). Lost

Stock, while making positive change, is only one small organization and the remainder of textile waste awaits an unknown fate (Roshitsh, 2020c).

The future of cotton and its availability is uncertain, but the sustainable alternative that recycled fibers supply can be certain (Roshitsh, 2020a). The push for sustainability is being felt in more than just the textile and apparel industry; it is a larger global challenge seeking solutions in technology and business (Keh, 2021). The COVID-19 pandemic has only emphasized the disparate systemic change needed to reduce our reliance on consumption (Amed, 2020; Cohen, 2020). Based upon recent themes in culture, like "wokeness" and transparency, the consumer mindset was already shifting to a new direction (Amed, 2020).

CONCEPTUAL FRAMEWORK

Sustaining Enterprise Operations and Productivity during Pandemic

The selected Enterprise Effectiveness and Sustainability Model (Obrenovic et al., 2020) has been constructed from existing business and management theories in response to the COVID-19 pandemic. This conceptual framework guides operational stability and resilience during a crisis from a background of current case studies (Obrenovic et al., 2020). The model identifies strategies for an organization's survival during and post-pandemic (Obrenovic et al., 2020). The variables it examines are organizational characteristics, business operations, the digital response, and financial plans (Obrenovic et al., 2020). The model emphasizes digital communication as key to success in a crisis, as it will establish transparency and trust with employees, stakeholders, and customers alike (Obrenovic et al., 2020). Overall, it concludes that

organizations must have a financial contingency plan in place to ensure sustainable operations in events such as the COVID-19 pandemic (Obrenovic et al., 2020).

The Enterprise Effectiveness and Sustainability Model is best fit to serve as a conceptual framework for this research on textile industry response during the pandemic. Most notably, it was constructed precisely for the current global crisis and the response of business operations occurring as a consequence of it. Moreover, the proposed variables in this research are parallel to the variables analyzed in the model. The visualization of the model in Fig. 1 of Obrenovic et al.'s (2020) research (see Figure 1) is extremely helpful in understanding this likeness. The proposed Enterprise Effectiveness and Sustainability Model will provide the researcher the best framework for which to measure textile recycling organization's resiliency and predicted success while navigating the current global crisis.

Figure 1

Enterprise Effectiveness and Sustainability Model during Pandemic

Note. Figure courtesy of Obrenovic et al., 2020.

Resiliency in Crisis

Resilience is the ability for an enterprise to experience and navigate through changes and ultimately survive and return to regular operating status (Diviney, 2021; Rai, 2021). This resilience can pertain to both failures and successes; an organization must be able to adapt to both in an uncertain environment (Diviney, 2021; Rai, 2021). Forward-thinking resilience means a business should be aware of their vulnerabilities so disruptions can be handled as they are presented (Rai, 2021). Obrenovic (2020) notes the cause of most prior global economic crises is rooted in the intersection of anthropology and biology (e.g., climate change, animal contagions, viral outbreaks).

COVID-19 has undoubtedly tested the resilience and recovery of organizations as worldwide lockdowns, in place as a precaution to stop the spread of the virus, led to an economic shutdown (Rai, 2021). In turmoil like that which COVID-19 has presented to the business landscape, it is important businesses focus on key organizational characteristics of operations, digital transformation, and financial planning (Obrenovic, 2020). Of course, not all industries were impacted the same, but Rai (2021) found those who were able to predict disruptions showed better survivability and higher likelihood of recovery. Resilience is important because it impacts more than the bottom line and profitability, it also maintains social sustainability of an organization, for example, welfare of employees, social development and security, and more positive environmental impacts (Rai, 2021).

Networked Business Structure. Outside of crisis, an organization should want to describe itself as flexible, adaptable, and agile (Obrenovic, 2020). Internal structure is highly important to this operational performance; thus the implementation of a networked structure will improve resilience to disaster (Obrenovic, 2020; Schweer, 2012). In line with basic chemistry and engineering, it is understood that a group of individual entities work better with an interlocked, symbiotic foundation; businesses are no different (Obrenovic, 2020). Baker (1992) defines a networked internal structure as one with fluid relationships among employees rather than fixed. Employees in this environment are highly valuable and have responsibilities outside of their prescribed role, optimizing talent effectiveness and problem-solving (Hanselman, 2021; Schweer, 2012). A networked structure encourages an environment where organizations are able to mold themselves to solve individual problems, this saves

time in decision-making and increases the autonomy of inter-employee relationships (Baker, 1992; Obrenovic, 2020).

Characteristic to the network structure, increased visibility of leaders and their responsibilities establishes trust and reliability throughout the organization (Hanselman, 2021; Obrenovic, 2020). An organization utilizing less of the traditional top-down leadership encourages real interactions and collaboration between people, problems, and resources (Baker, 1992; Obrenovic, 2020; Schweer, 2012). Studies show that organizations who transition to a networked structure increased profits by more than 15% and are better at improving environmental business practices (Schweer, 2012; Tate, 2013)

Supply Chain Flexibility. The flexibility of an organization's supply chain can be demonstrated through a redirection of supply flow or through the shifting of production to meet new and urgent demand (Obrenovic, 2020). This viability is tested during a time of constant change where structural redesign is expected to be long-term (Ivanov, 2020). In a viral pandemic like COVID-19, manufacturers and enterprises were able to demonstrate supply chain flexibility through the incorporation of personal protective equipment (PPE; Obrenovic, 2020; Patel, 2017). Obrenovic's (2020) framework suggests a reserve of emergency resource inventory and a re-examining of key business partners to ensure supply chain sustainability through a crisis. By prioritizing critical assets and relying on their local network, organizations can mitigate risks in supply chain vulnerabilities (Obrenovic, 2020; Staples, 2020). For future troubleshooting mid-crisis, Staples (2020) encourages businesses to anticipate

and plan for an increase or decrease in demand of their products as the landscape shifts to meet consumers' changing needs.

Company Culture. An organization of skilled and educated employees is an organization of empowered and successful people (Obrenovic, 2020). In times of a crisis, however, it is equally important for a business to support their employees as much as sustaining their operations (Staples, 2020). Despite financial challenges leading to mass layoffs and record unemployment in April of 2020, those still working must feel secure (both financially and emotionally) in the workplace (Bartik, 2020; Staples, 2020; U.S. Bureau of Labor Statistics, 2021). Moreover, micro-enterprises were among the greatest drivers of job loss during the pandemic (Brown, 2021). To provide this support, organizations can engage in dialogue for employees to safely voice their thoughts before making notable decisions or establishing a support plan (Obrenovic, 2020; Staples, 2021). Similar to assessing fitness of the supply chain, companies will find value in addressing workforce vulnerabilities as part of their disaster preparedness (Obrenovic, 2020).

Distributed Leadership. Stability in leadership is indicative of operational stability (Hanselman, 2021; Obrenovic, 2020). In the event one or more of key leaders are unavailable, however, a crisis management team is recommended for smooth transition into and out of a crisis (Obrenovic, 2020; Staples, 2020). A cross-functional emergency response team is beneficial in allocating resources, mitigating risks, and reporting to executive leadership during turbulent times (Staples, 2020). It is suggested that goal-setting and reasonable yet adjustable timelines are managed by this team as well as employee welfare checks, supply chain monitoring, development of a financial

contingency plan, marketing responses and high-level communications (Staples, 2020). Similar to the benefits of a networked employee structure, healthy leadership encourages open communication throughout the organization, which is shown to directly benefit innovation and adaptability of an enterprise (Hanselman, 2021). Leaders thrive when employees thrive and the investments in leadership development are best made ahead of a disaster, however, can be implemented mid-crisis as well (Hanselman, 2021).

Information Communications and Technology. To echo previous statements, an organization that wants to prove resilient in uncertain times, must resort to an emergency mode of operation (Obrenovic, 2020). In the 2020 COVID-19 pandemic, employees had the opportunity to move operations and roles online, and it is estimated as many as 70% of workers in the United States who had the opportunity to, did so in May of 2020 (Bick, 2020). This proves how integral digitalization, virtuality, and information communications and technology are to the current business landscape (Obrenovic, 2020). For some organizations, this technology, alone, is their product and/or supply chain, so digital resilience proves to be as necessary to business resilience as the other variables (Casalino, 2019; Fitriasari, 2020; Obrenovic, 2020).

An organization's transition to increased virtuality relies on collaboration of skills and technologies to increase services offered and marketplace competition (Casalino, 2019; Fitriasari, 2020). This competitive advantage, in the current culture of business, is enhanced by an enterprise's cultural diversity and social motivation (Fitriasari, 2020). In crisis times, however, communications technology is best utilized for communication with employees, stakeholders, and consumers, to establish trust in

and realization of the future outside of emergency operations (Obrenovic, 2020). For this reason, the technological proficiency of all employees is important in an enterprise-wide response to disaster (Casalino, 2019; Obrenovic, 2020). A new version of normal is coming and through global digital collaboration of people and business, there is an opportunity to use these virtual transformations for the betterment of a sustainable future (Kamal, 2020).

Financial Contingency Planning. The cooperation of leadership, technology, and employees all have significant positive impacts of disaster resilience yet having a financial plan to sustain operations in a time of disaster may be paramount in any resiliency plan (Bartik, 2020; Obrenovic, 2020; Smith, 2009). The COVID-19 lockdowns led to global economic downfall supported by a drop in demand of any product that was not entirely essential (Bartik, 2020). Falling demand is the precursor to an organization's financial disruption (Obrenovic, 2020). To navigate the challenges introduced when income is down, innovative emergency management is key to survival (Smith, 2009). Past case studies prove that enterprises who respond with panic, fear, and greed tend to loosen the grip on their core values, take on debt and ultimately fail (Smith, 2009). Staying the course, cost-cutting, and keeping cash on hand are suggested in the establishment of a successful financial contingency plan (Bartik, 2020; Obrenovic, 2020; Smith, 2009). Further, this plan should be based on company history and external case studies (Obrenovic, 2020).

Purpose Statement

Through the lens of the Enterprise Effectiveness and Sustainability framework, this research aims to assess the state of the textile recycling industry in the United

States amid the global COVID-19 pandemic. As raw materials are predicted to decrease in availability and increase in price, the textile and apparel industries must find environmentally friendly and cost-effective substitutes (Majumdar et al., 2020; Roshitsh, 2020a; Roshitsh, 2020b; Wang, 2017). By utilizing a circular supply chain perspective, these "new" materials can be produced from existing textile and fiber waste. This industry-wide shift to sustainable solutions has increased the focus on textile recycling technologies and organizations (Notman, 2020; Wang, 2017). The COVID-19 pandemic is ongoing, yet it is unknown how textile recycling is being impacted. This study will inform academics, industry professionals, and sustainable thought leaders of the progress being made in textile recycling in the United States. Further, it will highlight where attention needs to be focused for further improvement and development of infrastructure. Lastly, this research can serve as a baseline for more retrospective studies following the return to operational normalcy post-pandemic.

As the COVID-19 pandemic persists, little is known about its effects on domestic textile recycling efforts. This study is a novel exploratory approach based upon variables outlined in Obrenovic's (2020) framework. The following research questions guided the development of instruments and subsequent data analysis.

Research Question 1: How were textile recycling organizations in the United States impacted by the COVID-19 pandemic?

Research Question 2: Do organizations that self-report positively in these areas (structure, supply chain, culture, leadership, virtual communication technologies, and financial planning) prove to be resilient during a pandemic?

Q2a: Are organizations that maintain a stable networked structure more resilient in a pandemic?

Q2b: Are organizations that demonstrate flexibility in their supply chain more resilient in a pandemic?

Q2c: Are organizations with an adaptive company culture more resilient in a pandemic?

Q2d: Are organizations with non-centralized, distributed leadership more resilient in a pandemic?

Q2e: Are organizations who demonstrate proficiency in virtual communications and technology more resilient in a pandemic?

Q2f: Are organizations with a financial contingency plan more resilient in a pandemic?

Research Question 3: Did changes in business operations and employment that occurred as a result of the COVID-19 pandemic decrease the productivity of textile recycling organizations in the United States?

Research Question 4: Did changes in business operations and employment that occurred as a result of the COVID-19 that occurred as a result of the COVID-19 pandemic negatively impact the financial success of textile recycling organizations in the United States?

CHAPTER 3

METHODOLOGY

Research Design

This research explores the ways in which the textile recycling industry has been impacted by the COVID-19 pandemic. The case study approach has been selected to allow specific analyses into the varying experiences of nine different organizations with similar or different roles in the industry. As a novel exploratory inquiry, an intimate look at specific companies and their experience was warranted.

An instrumental case study was employed with the case being defined as the problem of the COVID-19 pandemic impacting the textile recycling industry, and the participating organizations are the units of analysis (Lune, 2012). While traditionally quantitative research, Touliatos (1988) states that a case study may also be qualitative. This research explores a single issue or case, situating it appropriately as instrumental (Lune, 2012). This category of case study is beneficial when the study will provide key information for future research by defining and exploring an external issue (Lune, 2012). This approach is applicable to this thesis as the exploration of the industry experience during COVID-19 will be informational in future inquiries.

The exploratory case study is relevant to research looking to investigate a phenomenon with consideration towards its real-life context (De Massis, 2014; Yin, 2003). The categorization of case study approach (e.g., exploratory) is informed by the aims of the study (De Massis, 2014). In this research, the case study will explore

organizational dynamics and social processes, both of which are appropriate for the exploratory design (De Massis, 2014). This approach is relevant, too, because it will help to understand the variables within company-specific settings through different lenses and data categories, allowing the phenomenon to be further understood (Eisenhardt, 1989).

The case study approach has been employed in previous studies assessing textile and fashion sustainability (e.g., Goworek, 2011; Ho, 2014; Savageau, 2011). Savageau (2011) utilized a single-case study to explore the diversion of textiles from landfill through redesign and university-level teaching. This study examined one project, Bags Across the Globe, and their use of bricolage as encouragement for sustainable design (Savageau, 2011). Similarly, a single-case study was carried out on People Tree, a business that operates with social and environmental sustainability top of mind (Goworek, 2011). Goworek (2011) utilized this approach to assess potential issues involved in the sourcing and production of a socially responsible garment. In a larger-scale operation, a case study was used to examine H&M's corporate environmental sustainability through the lens of eco-efficiency and eco-effectiveness (Ho, 2014). Alkaya (2014) assessed the availability and applicable of green supply chain solutions within a fabric manufacturing mill in Turkey with a case study approach. As organizations experiment with the opportunities and possibilities of more sustainable operations, the case study method allows for the collection of organization-specific data to inform what changes are valuable and effective. Further, this approach can be used to verify consumer-facing claims of responsible manufacturing and retailing in the clothing industry.

Location

Surveys were distributed and completed online. The primary reason for such is the current global pandemic restricting travel and social interactions. An additional benefit to online survey distribution is the ability to equally communicate with organizations across the United States, without preference given to a specific region. Utilizing online surveys allowed the researcher to communicate with representatives from textile recycling organizations at times that were available to both entities, and for respondents to reply at the most convenient time for them (Wright, 2005). This was especially beneficial as respondents were not just managing a global pandemic, but additional extreme winter weather affecting access to power and transportation during the times of data collection.

Population

Fashion brands and retailers are making headlines every day in recognition of their push for more sustainable operations. While many businesses are working to improve their existing production, design, and distribution channels (e.g., Adidas, Levi's, IKEA), other organizations operate independently for the recycling and redistribution of textile and apparel waste.

Textile recycling businesses operate throughout the United States, primarily as Micro, Small, or Medium enterprises, meaning they employ 250 people or less. The organizations in the population contribute in a myriad of ways to the reuse of textile material, the majority of which operate with the primary goal of keeping textile waste out of landfill. Businesses like Eileen Fisher in New York, The Renewal Workshop in Oregon, and SUAY Sew Shop in Los Angeles rework existing discarded garments to

make new textile products including bags, home linens, and clothes. Evrnu in Washington state and Circ (Tyton Biosciences) in Virginia chemically process clothing and textile waste to produce like-new fibers. Repreve in North Carolina is a pioneer in the reprocessing of PET from plastic water bottles into polyester fibers and yarns. Many organizations specialize in the collection and redistribution of discarded clothing, for example, Apparel Impact in New Hampshire, Goodwill nationwide, and Trans-Americas Trading in New Jersey. A new crop of innovative start-ups is emerging to tackle textile waste in a way that does not result in it being shipped overseas, some of these are Helpsy in New York, Terracycle in New Jersey, and Retrievr in Philadelphia. Lastly, actual physical textile waste must be processed for reuse or repackaging, and this research is inclusive of a business that manufactures the machinery, Harmony Enterprises in Minnesota.

Technological and structural advancements in this area are being implemented consistently in European markets and economies, primarily concentrated to Scandinavian countries (Sweden, Finland) and in Germany and the United Kingdom as well. The United States is sorely lacking in domestic textile recycling infrastructure, lending to this research's geographical specificity.

Prior to this study the researcher had no personal or intimate connections to the participants. In January of 2020, the researcher completed one volunteer session at FABSCRAP and was aware of the organization's work and mission through social media and news articles. During that session there was no communication between the researcher and the individual who later would complete the survey. This information of previous involvement was not shared with the representative from FABSCRAP

until all data was received. Ahead of the formal research dialogue, the researcher had been following two of the remaining participants (Helpsy, Wearable Collections) on Instagram. This previous knowledge had little to no impact on the research process, if anything, providing the researcher with increased awareness of the variety of organizations and their roles in the textile recycling industry.

Sample

A total of nine textile recycling organizations provided a response to the research survey. This is sufficient to inform a case study approach, as Collins (2006) suggests a minimum sample size of 3 to 5 participants. All the enterprises involved are located in the United States and participate at varying, but notable, levels of the textile recycling supply chain.

Of the nine respondents, seven are located in the Northeastern region of the United States (Massachusetts, New York, New Hampshire). This is notable because investors and researchers alike see opportunity for the growth of the circular textile industry specifically on the East Coast of the country (Accelerating Circularity, 2020; Donaldson, 2020; Mowbray, 2021). The remaining two are located in Texas and Minnesota.

Eight of the nine participants are managers (collectors, distributors) of textile waste. Only one of which (FABSCRAP) specifically handles pre-consumer waste. This is notable because the textiles and garments they collect have never been worn (some textiles are still on the bolt), so this "waste" is worthy of resale, redesign, or redistribution. Harmony Enterprises Inc. of Minnesota is the outlier of the sample as a

manufacturer of the machinery that executes physical recycling Their machinery is employed by many of the remaining involved companies.

El Madani (2018) categorizes enterprises by size according to their total employment. A micro-organization is one that employs ten or fewer, a small enterprise employs between 11 and 50, while a medium enterprise employs up to 250 people (El Madani, 2018). In this sample, four companies are micro, three are small, and the remaining two are classified as medium enterprises. Table 1 identifies the location of head office, role, and size (based on employment) of each participating enterprise.

Table 1

Participating Organizations and Characteristics

Name	Location	Industry Role	Size
Apparel Impact, LLC	Bedford, New Hampshire	Post-consumer textile waste collection	Small
Bay State Textiles Inc	Kingston, Massachusetts	Post-consumer textile waste collection	Small
Cyntex	Valhalla, New York	Textile waste recycling and redistribution	Micro
FABSCRAP	New York City	Pre-consumer textile waste collection and sorting	Micro
Green City Recycler	Houston, Texas	Post-consumer textile waste collection and sorting	Small
Harmony Enterprises Inc	Harmony, Minnesota	Manufacturer of recycling equipment and machinery	Medium
Helpsy	White Plains, New York	Post-consumer textile waste collection	Medium
Retrievr Inc	New York City	Post-consumer textile waste collection	Micro
Wearable Collections	Brooklyn, New York	Post-consumer textile waste collection	Micro

Recruitment

Organizations were selected for participation via purposeful sampling (Palinkas, 2013; Touliatos, 1988). This is a nonprobability method that was employed to ensure involvement from only organizations that participated in the textile recycling industry. Recruitment emails were sent to 29 textile recycling enterprises, and completed surveys were received from 9 of those. Following an initial review of the survey questions or due to low bandwidth, a few of the contacted businesses declined participation. No response was received from the remainder. While there is no formula for defining an appropriate sample size in qualitative research, based on the recommendations (Creswell, 2016; Yin, 2015), the hope was to retrieve data from 10-15 organizations. When the study ended up closed at nine responses, the case study method was formally employed and applied (Collins, 2006).

Data Collection

A 30-question survey was distributed to participants (see Appendix X). Surveys are useful in analyzing non-random phenomena without altering the experiment (Touliatos, 1988). “In inquiring about the status quo, [surveys] ask about what exists without regard for why it exists” (Touliatos, 1988, p.264). Surveys are beneficial in understanding complex issues in the social sciences (Touliatos, 1988).

This survey instrument included an assortment of multiple-choice and open-ended questions, and six matrix tables (Touliatos, 1988). The survey asked about general business data (size, location), perceived experiences during the COVID-19 pandemic (overall reaction, areas of impact, timeline of changes), employee reactions to the COVID-19 pandemic, industry role, and addressed the six variables outlined in

Obernovic's (2020) COVID-19 sustainability framework (company structure, culture, supply chain, leadership, digitalization, and finances). The matrix tables were used to compare an organization's closeness to the conceptual framework and had a range of 3 to 16 statements which respondents could select as being extremely accurate, moderately accurate, or not accurate at all to their business.

Data Recording

Surveys were administered through Qualtrics, which automatically collects and stores the raw responses as well. The first round of email outreach, including an anonymous link to the survey, was sent to participants on February 11, 2021. The first two responses were submitted on that day. The final call for participation was sent on February 22, 2021. The final survey response was recorded on February 25, 2021. A total of nine complete and viable survey responses were recorded in two weeks. Any unidentifiable, incomplete or blank responses automatically recorded by Qualtrics were deleted prior to data export and analysis.

Institutional Review Board Approval

Attached to the participant's requests for participation was the approval from the University of Rhode Island's Institutional Review Board (IRB; see Appendix X). This approval insured participants they were involved in ethical academic research and were protected through the entirety of the process. In addition to the inclusion of this formal document, participant consent was achieved in the first question of the survey. This verbiage echoed that of the recruitment materials, again ensuring protection and autonomy during involvement in this research. In the IRB approval process, this

research qualified for exempt status because no human subjects were vulnerable to harm or identification in the study.

Data Analysis

Data Coding

Survey data was coded using the a priori coding scheme (Johnson, 2019; Touliatos, 1988). The a priori codes were theory-driven, as they were utilized to analyze data against the conceptual framework (DeCuir-Gunby, 2011). Code development, in this research, was an iterative process that revisited Obrenovic's (2020) framework (DeCuir-Gunby, 2011).

The utilization of multiple-choice matrix tables left respondents with only 3 possible responses, in addition to no response. The responses were "extremely accurate," "moderately accurate," or "not accurate at all." Codes assigned to this data were numerical and based upon if the associated statement agrees with Obrenovic's (2020) Enterprise Effectiveness and Sustainability framework. If the statement did apply, "extremely accurate" was coded 1 and "not accurate at all" was coded 0. If it did not apply, "not accurate at all" was coded 1 and "extremely accurate" was coded 1. In both cases "moderately accurate" was seen as middle ground and was coded as 0.5.

The application of numerical codes to the data allowed the researcher to clearly establish if an organization was in full or partial agreement with the selected conceptual framework. Further, if the organization ranked closely to the framework, did they report positive impacts on their business from the events of the COVID-19 pandemic? These answers allow the researcher to weigh whether the framework is entirely accurate, or, at the least, applicable to textile recycling organizations.

Thematic Analysis

Thematic is a method of data analysis that utilizes coding to derive themes from data (Clarke, 2016; Neuendorf, 2019). This method frames verbal and textual responses as raw data and allows the themes and trends to develop from the provided data (Clarke, 2016; Neuendorf, 2019). Preliminary concepts can be established ahead of analysis (a priori) but these remain malleable, and the majority of conclusions are drawn alongside further digestion of the data (Neuendorf, 2019). A benefit of this method is that themes can be derived without obligation to a theoretical framework (Clarke, 2016). The result of thematic analysis is a concise collection of overarching conclusions drawn directly from the data (Neuendorf, 2019).

Content Analysis

Similarly, content analysis is a method of historically quantitative data analysis that uses codes to derive results and conclusions from data (Neuendorf, 2019). Here the textual data is looked at as phenomena to be examined (Neuendorf, 2019). The codes applied in this method are numeric, representative of thematic categories, and the application of statistics informs summarization of the data (Neuendorf, 2019). The coding scheme is also established a priori, ahead of the analysis (Neuendorf, 2019). In content analysis, intercoder reliability is integral to proving the validity of conclusions (Neuendorf, 2019).

Methodological Integrity

To ensure reliability in data coding and analysis, two individuals independently coded the survey data using an established codebook. For this research, the first coder was the primary researcher, and the second coder was a trained undergraduate student.

The use of a second coder reduces coding bias and increases intercoder reliability (Allen, 2017). With a codebook as straightforward as the one used in this research the reliability is primarily checking for human error. The two coders worked independently without knowledge of one another's results.

Holsti's method is a simple agreement formula that measures percent agreement between two sets of codes derived from one set of data (Allen, 2017). Holsti's (1969) formula for percent agreement is:

Percent agreement = A / *N*

Where A is equal to the total number of matching codes, or agreements, between the two coders, and *N* is equal to the number of units which were coded by each coder (Allen, 2017). To determine intercoder reliability with Holsti's (1969) formula:

Intercoder reliability = 2 x *M* / (*N*1 + *N*2)

Where *M* is equal to the total number of agreements between the two coders, and *N*1 is equal to the number of decisions made by Coder 1 and *N*2 is the number of decisions made by Coder 2 (Allen, 2017). Using Holsti's formula for intercoder reliability can result anywhere between no agreement at 0, and perfect agreement at 1, or anywhere between the two integers (Allen, 2017). A percent agreement higher than .9 is decidedly a high level of intercoder reliability (Allen, 2017).

The application of Holsti's (1969) formulas to this research and its two coded sets of data provided almost-perfect results. Both the percentage agreement and intercoder reliability measured out at 0.99. This proves that the codebook was effective and the information is strong. Table 2 breaks down the results by variable.

Table 2

Holsti's Method and Results

Variable	Intercoder Reliability
Network Structure	100%
Supply Chain Flexibility	97.98%
Company Culture	100%
Leadership	100%
Communications & Technology	100%
Financial Planning	100%
Total Average	**99.60%**

CHAPTER 4

FINDINGS

The purpose of this research is to assess the state of the textile recycling industry in the United States amid the global COVID-19 pandemic. The data was analyzed through the Enterprise Effectiveness and Sustainability Model (Obrenovic, 2020). The findings of the study are organized by theme based on this framework. The respondents to the survey are nine organizations based in the United States who participate in the textile recycling industry at varying levels. The majority of these companies are located in the northeastern region of the country. Four are categorized as micro enterprises, three as small enterprises, and two and medium enterprises (El Madani, 2018).

Resiliency in crisis

An organization demonstrates resiliency through both good and bad changes by how quickly they return to operational normalcy (Diviney, 2021; Rai, 2021). Across the nine organizations surveyed, there is a clear distinction as to who was able to quickly navigate the impacts of the COVID-19 pandemic, and those who are still in a state of unknown. Organizations were asked when they began to experience changes, when those changes were the most turbulent, and when/if they have returned to pre-COVID operational status, and/or when/if they have a plan to. The resulting timeline is illustrated in Table 3.

Table 3

Timeline of Reported Changes in Business Operations

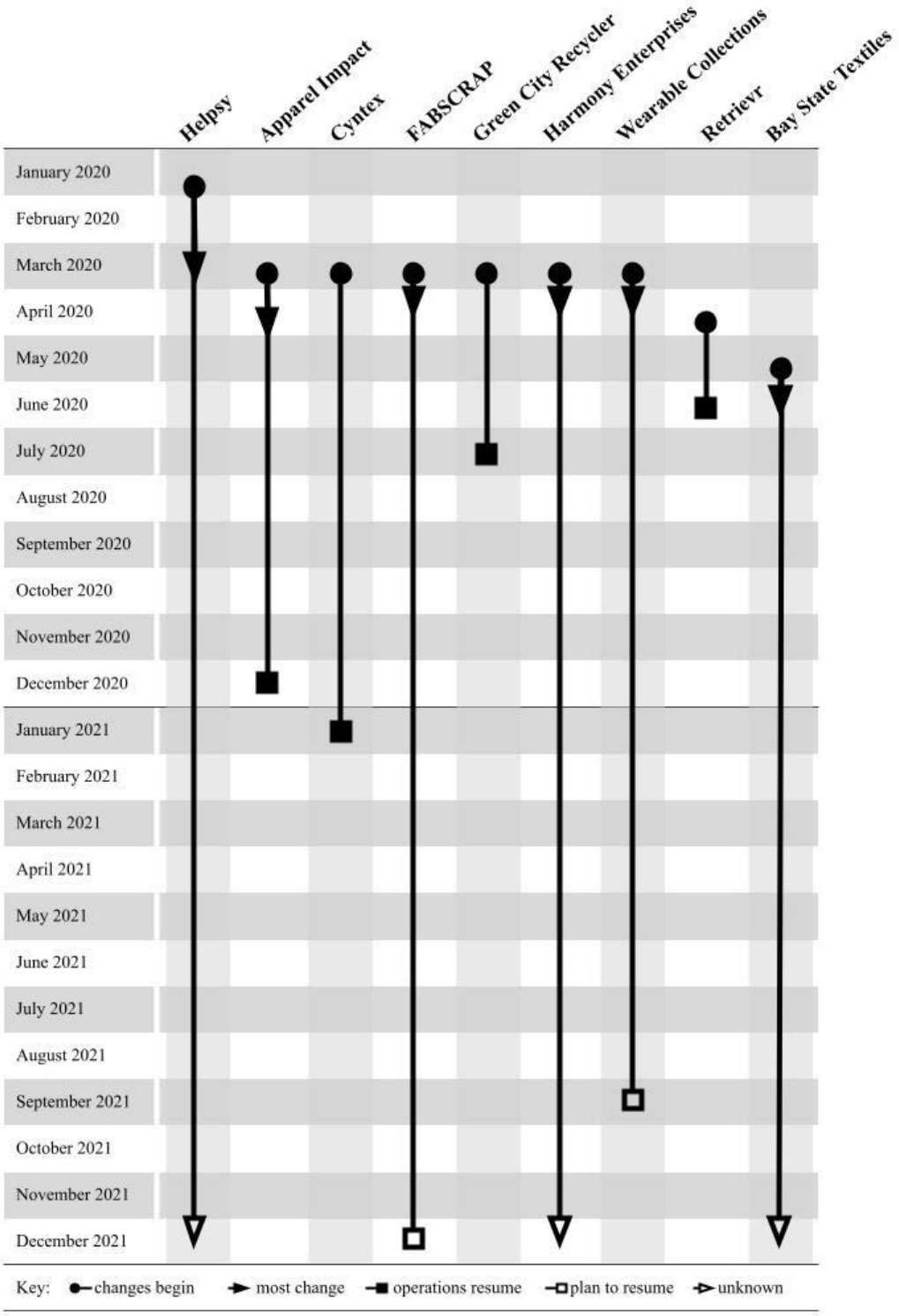


Table 3 visualizes a very clear distinction between organizations who had the strategy and resources to return to normalcy fairly quickly (Apparel Impact, Cyntex, Green City Recycler, Retrievr) and those who are still currently making changes and navigating through the crisis (Helpsy, FABSCRAP, Harmony Enterprises, Wearable Collections, Bay State Textiles).

The organizations able to report the return to pre-pandemic operations within the year share similarities. All are micro or small enterprises, and three of the four operate outside of large metropolitan areas (Cyntex, Upstate New York; Apparel Impact, New Hampshire; Green City Recycler, Texas). Retrievr services Philadelphia with headquarters located in New York City, yet may have experienced such a quick response due to its change in Chief Executive Officer in May (Blatt, 2021; Paben, 2020). Despite recommendations from the framework, three of these four organizations (Apparel Impact, Green City Recycler, Retrievr) responded that they made quick decisions in times of crisis, however, later responded that they prioritise informed decisions over immediate ones. Obrenovic (2020) suggested that it is more important an enterprise thinks through their major decisions. For these companies, speed may have been on their side in the end.

All four of these companies reported remaining adaptable and flexible and this also proved to be beneficial. Further, three of the four (Cyntex, Green City Recycler, Retrievr) reported no change in supply flow during the pandemic. Apparel Impact reported partial redirection in their supply chain, yet they and Cyntex did report the novel incorporation of PPE distribution into their operations. The speed of action and reactions among these organizations may be due to their small size which gave way to

centralized leadership and clear and effective internal communication channels throughout the COVID-19 pandemic. Despite none of these four having established crisis management teams prior to the year 2020, they each made quick decisions which put them back on track in less than 12 months. Apparel Impact, Cyntex, Green City Recycler, and Retrievr proved to be effectively resilient during the COVID-19 global crisis.

Networked Business Structure

Studies in organizational behavior show that businesses with a strong and networked structure are more profitable, environmentally sustainable, and adaptable to changes (Obrenovic, 2020; Schweer, 2012; Tate, 2013). Theoretically, this structure should prove especially resilient during a crisis like COVID-19 (Obrenovic, 2020). This research found the framework was strongly supported by two textile recycling organizations, Helpsy and Retrievr. Both organizations responded positively 10 of the 11 proposed statements, most notably, reporting their organizations do not ascribe to the traditional one-way top-down style of management which is not present in a successfully networked organization. Similarly, they agreed their trusted group of leaders collaborated with employees at all levels before making decisions and ensuring that those decisions were distributed efficiently throughout the company. Identical positive responses were also recorded regarding employees' attitudes towards their professional relationships, agreeing that they are trusting and transparent. A notable difference between the businesses is that Helpsy is labelled as a medium organization, employing between 51 and 250 people, while Retrievr is a micro-organization because it employs 10 or fewer people (El Madani, 2018). This discernable difference shows

that all sizes of textile recycling organizations are capable of maintaining a successfully structured operation.

Across responses from all organizations, the most applicable was the textile recycling companies remained flexible and adaptable to change. Bay State Textiles did not provide a response to this statement, and Harmony Enterprises disagreed with it. Because Harmony Enterprises is a manufacturer of recycling machinery and parts, their roles and company structure can expect to remain largely the same, in crisis or not. Interestingly, Harmony Enterprises was the only company to report not coming to quick conclusions, suggesting that they took time to make thoughtful decisions in times of turbulence.

The quick and efficient flow of internal information received an overall positive response from respondents, alongside the acknowledgement that leader(s) in the organization are a trusted group of professionals. For reasons unknown, Cyntex did not respond to 10 of the 11 statements in this section. Perhaps, as a micro enterprise, the respondent did not feel that statements were representative of their minimal number of employees.

Supply Chain Flexibility

The framework suggests that an organization which demonstrates flexibility in their supply chain through reliable relationships and the ability to redirect flow or shift production, will subsequently prove resilient in times of crisis (Obrenovic, 2020). Brooklyn, New York-based Wearable Collections reported the strongest supply chain flexibility of the sample, citing reliable leaders and strong supply chain partnerships as integral to navigating temporary legislative policies restricting their ability to maintain

business as usual and, ultimately, having to redirect their supply flow during the pandemic. Bay State Textiles and Cyntex also reported moderate results in their supply chains. Cyntex agreed that company leaders and industry relationships were key to success and added that they were able to incorporate essential PPE into their pandemic-era supply chain. Apparel Impact, while reporting the lowest results in this section, also were able to facilitate the distribution of PPE. The positive communication between supply chain partnerships, despite their own pandemic-related challenges, proved to be the most supported statement across all responses. This proves the strength of the external professional supply chain network surrounding a textile recycling organization is as important to its operations as is a strong internal network. Overall, the nine organizations reported low-to-moderately in terms of supply chain flexibility during the COVID-19 crisis.

Company Culture

Research shows that the culture among employees within a company is a driver for success (Obrenovic, 2020; Staples, 2020). This means employees are confident and trained in their positions, and feel supported by leadership, as well as one another (Staples, 2020). Especially during a stress-inducing global crisis it is important that the workforce of an organization feels secure (Bartik, 2020). Of the businesses surveyed, two aligned the most closely to the signifiers of positive company culture as outlined by the conceptual framework, these were Retrievr and Wearable Collections.

Retrievr and Wearable Collections both identified that their organizations operate as a network of trained and knowledgeable employees who are flexible in their

roles and responsibilities. Further, the informal discourse among employees and leaders allowed a response of thoughtful collaboration during the chaos of the pandemic. To the proposed statements, both Retrievr and Wearable Collections reported moderate results in terms of all employees demonstrating leadership skills, as well as company leadership feeling prepared and aware of vulnerabilities ahead of the crisis. Interestingly, both organizations shared that the financial changes imposed by the pandemic did lead to furloughs of layoffs.

Both Retrievr and Wearable Collections are classified as micro-organizations. The third most positive responses came from Helpsy, a medium enterprise, however, the responses from Harmony Enterprises (also medium) scored the lowest as they largely disagreed with the statements proposed by the framework. The small enterprises surveyed did respond positively yet compared to the sample fell in the middle. This data suggests that a smaller team is more likely to have positive company culture, however size is not the only telling factor.

In this category all organizations responded positively when asked about informality among employees, the importance of informed and collaborative decision-making, and they felt, at some level, that their business landscape remained adaptable as changes occurred.

Distributed Leadership

According to Hanselman (2021) and Obrenovic (2020), stable leadership is a precursor to operational stability. Therefore, it is important an organization has a reliable team of leaders or an established and trained crisis management team in order to navigate changes in turbulence (Obrenovic, 2020; Staples, 2020). Green City

Recycler, Retrievr, and Helpsy, respectively, reported the 3 highest responses in this category. These organizations had identical positive responses in terms of their leadership prioritizing effective communication for a steady flow of information to employees throughout pandemic-related changes. Additionally, they all reported that leadership was reliable despite personal stressors and that decisions were made for the benefit of the company, consumers, and employees. Further, they all responded moderately that decision making within the organization is not entirely centralized, suggesting they incorporate the feedback from varying levels of employees and perspectives before drawing significant conclusions. This decentralized form of leadership is highly applicable to Obrenovic's (2020) framework.

None of the companies reported having an emergency response team established prior to the pandemic, but three (Green City Recycler, Harmony Enterprises, and Retrievr) implemented one during.

Information Communications and Technology

Virtuality is necessary to operate in an emergency in which people are encouraged to remain at home in order to lower the spread of a highly contagious virus (Casalino, 2019; Fitriasari, 2020; Obrenovic, 2020). The most successful organizations, according to the framework, took advantage of digital solutions and engaged with their consumers and community from a distance, despite their organizations relying on physical textile waste. These top-scoring organizations are Cyntex, FABSCRAP, and Green City Recycler. All three reported the internet as being key to their supply chain, as well as to communication with consumers and stakeholders. Cyntex and FABSCRAP stated that all of their employees are

technologically proficient, yet FABSCRAP and Green City Recycler confirmed that for some of their employees, digital proficiency is not applicable or required in the success of their roles. This statement was applicable at varying levels to the majority of the organizations in the sample.

Obrenovic (2020) suggested the establishment of a crisis-specific online platform to enhance internal communications during the pandemic, yet only FABSCRAP identified doing so at a moderate level. This, however, paid off as their information and communications technology remains a key asset to their ongoing resiliency efforts.

Bick (2020) estimated that upwards of 70% of United State employees who had the ability to pivot to remote, at-home work did so in May of 2020. This statistic was reflective of the sample data, as 6 of the 9 enterprises (66.7%) reported a change to remote work in some capacity. Those responses are represented in Table 4. This data implies that the ability to pivot to remote responsibilities was not directly beneficial to operational resilience during the pandemic, as only two of the four organizations who have resumed operations utilized remote work options.

Table 4

Question 15. Were any of the organization's employees able to pivot to remote work?

Organization	*Yes, full job responsibilities were able to be completed in a remote capacity*	*Yes, with modified job responsibilities*	*No, their job requires physical presence in a company facility*
Apparel Impact			X
Bay State Textiles	X		
Cyntex	X		
FABSCRAP		X	
Green City Recycler			X
Harmony Enterprises	X		
Helpsy	X		
Retrievr	X		
Wearable Collections			X

Financial Contingency Planning

Above all other variables, perhaps, of utmost importance is an organization's financial planning and resiliency in order to sustain monetary support through times of uncertainty (Bartik, 2020; Obrenovic, 2020; Smith, 2009). COVID-19 social lockdowns led to an economic downfall supported by a drop in demand of any product that was not deemed essential (Bartik, 2020). These responses, from all nine enterprises, were the most negative. All responses indicated financial hardship inflicted by the pandemic, as well as a drop in demand for product and/or services.

Finally, when asked about financial contingency planning established prior to the crisis, four of the nine organizations responded that there was a moderate plan in place to handle a financial disaster; those who responded positively are Bay State Textiles, Green City Recycler, Helpsy, and Retrievr.

Bay State Textiles scored the highest in this category, as they responded moderately to all questions. This suggests that they reported experiencing a slight financial hardship, less impact on demand for services, and had somewhat of a contingency plan in place ahead of time.

CHAPTER 5

DISCUSSION

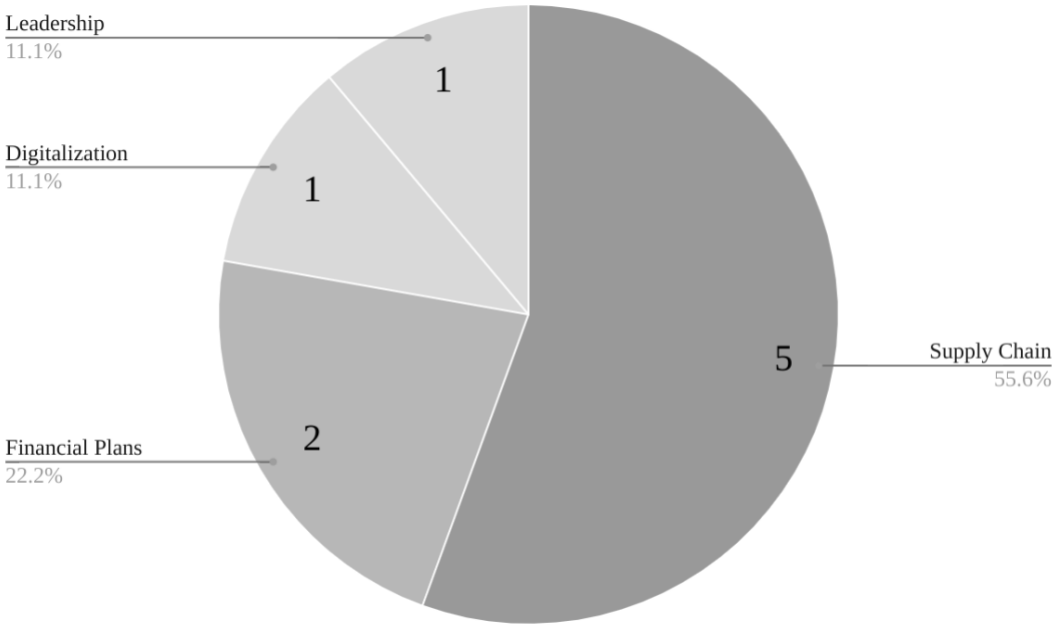
Through surveying domestic textile recycling organizations, an assessment was made on how the industry at large is faring during the global COVID-19 pandemic. The data was able to answer all research questions, including one addressing applications to the conceptual framework.

Research Question 1: Impacts of COVID-19 on Textile Recycling Organizations

Each textile recycling enterprise reported a myriad of effects, and content analysis of the data allowed major trends to emerge. Figure 2 organized the self-reported area of most change for all organizations. Five of the nine (55.6%) indicated they experienced the most change in their supply chain. Two of the remaining four responded the most changes occurred in finances, while the last two reported changes in leadership and digitalization.

Figure 2

Aspects of the Business Reported to Have the Most Change



Among those who reported the most change among their supply chain, the impacts varied greatly. Two of those five reported changes in terms of a decrease in waste intake, while the other three reported an increase. There was no emergent or obvious commonality among those organizations and why or how their supply chains changed.

All nine organizations reported a quantifiable change in material intake, output, and overall processing during the pandemic. Table 5 summarizes the responses of each organization in this category.

Table 5

Impacts on Quantifiable Product Input, Output, and Description of Change

Organization	*In terms of quantity, did product intake change during the pandemic?*	*In terms of quantity, did product output change during the pandemic?*	*What was the most significant change?*
Apparel Impact	Increase	Increase	Quantity
Bay State Textiles	Increase		
Cyntex	Decrease		Volume
FABSCRAP	Decrease	Decrease	Time
Green City Recycler	Increase	Decrease	Time
Harmony Enterprises	Decrease		Time
Helpsy	Increase	Increase	Volume
Retrievr	Increase	Increase	Volume
Wearable Collections	Decrease	Decrease	Volume

Note: Blank spaces indicate no response.

Table 5 makes clear the varying result of impacts and changes across similar operations in the same industry. Organizations who reported an increase in textile waste intake did not always report an increase in output. Green City Recycler reported an increase in intake yet a decrease on the opposite end. They said the processing time of materials within the organization was the greatest observed change. Further, this business reported the inability to shift roles to remote work and financial hardship resulting in furloughs or layoffs. Their pandemic recovery efforts, presumably, will

include the rehiring of employees to fill vacant positions and require greater efficiency in product processing to decrease materials they are in ownership of.

Organizations who reported a decrease in intake also reported a decrease in output. This is supported out as there was less material within the organization to work with. Of these responses, volume of product and time to process were the most observed change. FABSCRAP and Wearable Collections both reported these results. Both operations are located in New York City where COVID-19 restrictions were especially tight because infection rates were understandably high. Consequently, while Wearable Collections reported the application of employee furloughs and/or layoffs, FABSCRAP did not. FABSCRAP was able to pivot to partially remote operations, and Wearable Collections required physical labor for full operation. Both New York-based businesses are categorized as micro, thus with employment numbers totaling 10 or below, the loss (temporary or otherwise) of one single employee can be detrimental.

Drawing from all of the data, textile recycling organizations in the United States were impacted mostly within their supply chain, which includes the product intake and processing, primarily material volume and processing time. No major trends or correlations emerged in these categories, as the impacts varied by region, company size, etc. Across the board, all organizations experienced negative financial impacts, less than half of these organizations utilized employee furloughs or layoffs to survive the crisis.

Research Question 2: Resiliency

An analysis of the sub questions addressing Obrenovic's (2020) framework is presented in Findings. In summary, the framework was partially supported by the responses of these nine organizations. The most outstanding discrepancy was the suggestions or requirements as outlined by the framework did not apply to some companies, for example, textile recycling largely requires human labor for the sorting of waste within an organization and these laborious jobs and responsibilities are impossible to transition into a remote capacity. So, Obrenovic's (2020) recommendation of increasing the virtuality of operations would not be pertinent.

There was notable alignment and success among the sample and their reports once compared against the framework. Retrievr was cumulatively the highest scoring organization against the framework. They rated especially high in the areas of company structure, culture, and leadership. This suggests that perhaps these areas are the most important to resilience, as the timeline shows Retrievr rebounded from initial changes the fastest of the sample. These results support and reinforce Obrenovic's (2020) framework and suggestions for enterprise sustainability during the COVID-19 pandemic.

Following Retrievr is Cyntex, who demonstrated strengths in communications technology and supply chain flexibility. Like the former organization, Cyntex is a micro enterprise, perhaps suggesting that it is easier to navigate a smaller company through tumultuous times. In terms of the timeline, Cyntex reported resuming operations in less than a year which, comparatively, is impressive. This success may also be able to support the framework.

Generally, the key areas of business that Obrenovic (2020) outlines in the Enterprise Effectiveness and Sustainability model are applicable to most current-day organizations. For specific industries, however, the priorities can be modified. For example, while digitalization is proving to be beneficial in the resiliency of some sample organizations, it could be argued that company structure, leadership, and supply chain play a larger role.

Research Question 3: Productivity of Organizations

Overall productivity was stunted by the changes imparted on textile recycling businesses. Every participant indicated financial hardship during the pandemic. From this, four of the nine organizations reported implementing furloughs and/or layoffs. Interestingly, two businesses (who were not part of the former group) reported an increase in employees during the pandemic. While some operations were able to return to pre-pandemic status sooner than others, all participants documented at least 3 months of changes or more. These months of change, and for many the continued change, means productivity was not consistent, and was, therefore, decreased due to the pandemic.

The outlier to this conclusion is Retrievr. This organization reported increased product intake, increased output, and specified that volume of product was the most notable change. Further, Retrievr indicated that all positions in the organization were able to pivot to fully remote operation. Despite these largely positive impacts, they did report both positive and negative effects from the crisis, and on the timeline, indicated significant change from April to June 2020. Retrievr reported a return to pre-pandemic

operation status in June, yet also noted that “change is current and constant in the business now.”

Research Question 4: Financial Impacts

Like productivity, the unpredictable change that accompanied the pandemic did lead to negative financial impacts on textile recycling organizations in the sample. Two organizations selected finances as their area of most impact while only one chose it as their least-affected area. Five of the nine organizations listed financial stress as a major stressor on their employees, and four of those were experiencing such hardship that they implemented furloughs and/or layoffs. Finally, all businesses in the sample reported experiencing financial hardship and attributed this challenge directly to the pandemic.

CONCLUSION

Research Limitations

The most prominent limitation to this research is the unrelenting COVID-19 pandemic. Despite it being the exact topic of the research, the presence of the virus made the potential of site visits or in-person, in-depth conversations responsibly impossible. Photos and/or first-person data gathering would have added color and context to the results, however, there is an opportunity for future studies to investigate the crisis in hindsight.

Additionally, the uncertainty associated with the ongoing pandemic acted as a limitation because it did not allow respondents from organizations who are still navigating changing to fully assess their operations during their response. The

responses were only gathered from the perspective of the participants so there is an unavoidable bias as all information was self-reported. The ability to observe the organization or speak to multiple sources would have provided a more well-rounded dataset. The final question of the survey allowed for an open-ended response for further comments or context. Only the representative from FABSCRAP responded, and highlighted this uncertainty:

> "Though we've reopened and returned to work, I want to note that the pandemic is not over. … we are still modifying operations, policies, hours, and budget in response to uncertainty about vaccine roll-out and new strains."

Future studies will have the opportunity to gather data from businesses post-vaccination and when they have fully returned to pre-COVID operations. As this study was conceptualized last year, the proverbial end of the pandemic was just as unknown then as it remains now.

At the beginning of this research, the researcher intended to employ the survey method alongside semi-structured interviews in order to carry out an in-depth quantitative study. Despite a high number of textile recycling enterprises in the United States, this research garnered responses from only nine. This small sample size allowed the dissection of each organization's experience but was pivoted, late in the research, to a case study. A higher number of responses would have allowed for greater trends to be observed nationwide or, perhaps, industry wide.

According to Touliatos (1988, p. 347) a case study approach requires multiple modes of data collection. Due to low engagement and the late change of methodology, this was not achieved. Lastly, the coding errors serve as limitations to the research.

Holsti's (1969) formula was used to calculate intercoder reliability between two coders and the resulting percent agreement was 99.6% due to human error in coding. According to Steinke (2004), intercoder reliability operationalizes and validates qualitative data. Without this evaluation criteria, qualitative research risks being random and arbitrary, thus faces rejection (Steinke, 2004).

Implications

These conclusions have implications for future studies and in business practices. Academics, researchers, and professionals looking to assess the domestic textile or fashion industry can utilize these results and analyses. The knowledge established in this study can serve as a baseline for the status of textile recycling organizations in the United States amid the COVID-19 pandemic. The need for research on sustainable fashion industry practices can be supplemented by these conclusions. The pandemic is still ongoing, and its final impacts remain unknown and, frankly, unpredictable. This research will aid in drawing those future conclusions, as it stands as a snapshot in time in understanding challenges and where operational and organizational improvements in sustainable businesses can be made.

Networked Structure

This research highlights the benefits of a networked organization. While it is not advisable a company switch immediately from a traditional top-down structure, small changes over time can aid in the transition. The first sign of a well-networked business is the adaptability to change, which was present in most of the responses here. The goal of this structure is not to take power and control away from leaders, but instead to improve information flow, decentralize decision-making, and increase trust

across professional relationships. As found in this study, this structure works in both micro- and medium-enterprises.

Supply Chain Flexibility

For organizations making an effort to continue work and push through a crisis, the flexibility of one's supply chain is helpful, yet not the top priority. Those looking to strengthen their supply chains can improve their relationships with supply chain partners through transparent communication. This research proves that the strength of the external professional supply chain network surrounding a textile recycling organization is as important to its operations as is a strong internal network.

Company Culture

The acknowledgement and improvement of culture within a company has grown in importance in recent years. A healthy company culture is one with employees who feel supported in more ways than professionally, though proper training and positive leadership are contributing factors. Informality among employees improves collaboration, adaptability, and decision-making. Even among organizations facing financial challenges, the ability to feel secure in one's job helped employees to feel optimistic. This research suggests that a smaller team is more likely to uphold positive company culture.

Distributed Leadership

In all businesses, leaders and executives are integral to decision-making and operations. The most important takeaway from this research is the importance of appointing an emergency response team available and ready for times of crisis. This team is responsible for communicating with leaders and stakeholders and are equipped

to navigate through challenges as they arise. In the event that a business leader is unavailable (perhaps due to illness, etc.) this team is prepared and stable enough to take over.

Information Communications and Technology

The framework suggests the implementation of a crisis-specific online platform to facilitate communications throughout the company and to key stakeholders. This research proved that this is not entirely necessary when facing a crisis, however, utilising the internet remains important for company-wide communication. Digital strategies can be beneficial in maintaining engagement with consumers especially when home-bound in a pandemic. In textile and recycling-specific organizations where physical product and labor is necessary, this research found that the ability for employees to pivot to a remote, work-from-home position was not available or directly beneficial to resilience.

Financial Planning

A global crisis as impactful as COVID-19 is bound to incur economic damage. While it would be impressive to maintain financial stability, it is neither expected nor realistic. The primary implication supported by both the framework and this research is the value of financial contingency plan. Likely put together by the emergency response team, this helps realign priorities when an enterprise is working through a crisis with decreased demand for products and services.

APPENDICES

Appendix A

Figures

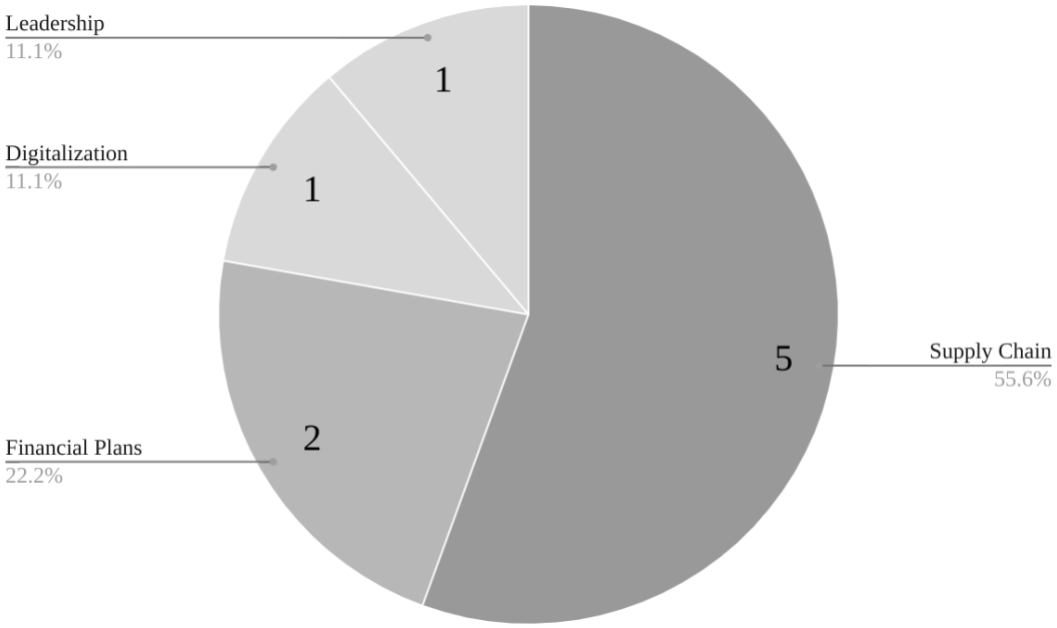
Figure 1

Enterprise Effectiveness and Sustainability Model during Pandemic

Note: Figure courtesy of Obrenovic et al., 2020.

Figure 2

Aspects of the Business Reported to Have the Most Change



Appendix B

Institutional Review Board Approval

THE
UNIVERSITY
OF RHODE ISLAND
DIVISION OF RESEARCH
AND ECONOMIC
DEVELOPMENT

OFFICE OF RESEARCH INTEGRITY
70 Lower College Road, Suite 2, Kingston, RI 02881 USA
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THINK BIG WE DO℠

FWA:	00003132
IRB:	00000599
DATE:	December 14, 2020
TO:	Jessica Strübel , Ph.D.
FROM:	University of Rhode Island IRB
STUDY TITLE:	The Textile Recycling Industry and the Covid-19 Pandemic
IRB REFERENCE #:	1682312-2
LOCAL REFERENCE #:	IRB2021-089
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
EFFECTIVE DATE:	December 14, 2020
REVIEW CATEGORY:	Exempt 2i

Thank you for your submission of materials for this research study. The University of Rhode Island IRB has determined this project falls into the **EXEMPT REVIEW** category according to federal regulations 45 CFR 46. Per URI IRBpolicy, the project has been reviewed by either the IRB Chair or the IRB Administrator. **Approval is valid for the duration of the project.**

No changes to procedures involving human subjects may be made without prior IRB review and approval. You must promptly notify the Office of Research Integrity of any problems that occur during the course of your work using Appendix S - Event Reporting.

If you have any general questions, please contact us by email at researchintegrity@etal.uri.edu. For study related questions, please contact us via **project mail through IRBNet**. Please include your study title and reference number in all correspondence with this office.

Matthew Delmonico, Ph.D., MPH
IRB Chair

Appendix C

Survey Instrument (distributed via Qualtrics)

STUDY TITLE: *The Textile Recycling Industry Response to the COVID-19 Pandemic*

General Business Information

Q1. What is the name of the textile recycling organization for which you will be responding on the behalf of?

Q2. Where is the company headquartered?

Q3. What states or regions of the United States does the organization serve?

Q4. Does the organization operate in any part outside of the United States?

No
If yes, please specify which country or countries: _____

Q5. Is this company privately held, publicly held, or non-profit?

Privately held
Publicly held
Nonprofit

Q6. Overall, how would you report that the business was affected by the COVID-19 pandemic?

Positively
Negatively
Both positively and negatively
The business was not affected at all by the pandemic

Q7. What aspect of the business experienced the most change?

Organizational structure
Organizational culture
Supply chain
Leadership
Communications and technology
Financial plans
Other: _____

Q8. What aspect of the business experienced the least change?

Organizational structure
Organizational culture
Supply chain
Leadership
Communications and technology
Financial plans
Other: _____

Q9. At what time did changes in the business begin to occur?

Before January 2020
January 2020
February 2020
March 2020
April 2020
May 2020
June 2020
July 2020
August 2020 or later
The business experienced no change

Q10. At what time was the organization experiencing the most change?

Before January 2020
January 2020
February 2020
March 2020
April 2020
May 2020
June 2020
July 2020
August 2020
September 2020
October 2020
November 2020
December 2020 or later
Change is current and constant in the business now
The business experienced no change

Q11. If the business ever returned to the full operating state it was in prior to the pandemic, when did that occur?

March 2020
April 2020
May 2020
June 2020
July 2020
August 2020
September 2020
October 2020
November 2020
December 2020
January 2021
Business has not yet resumed full operations
The business experienced no change

Q12. If there is a plan in place to resume full operations, when is that due to occur?

January/February 2021
March/April 2021
May/June 2021
July/August 2021
Fall 2021
Winter 2021/2022
Spring 2022
Later than spring 2022
Unknown
The business experienced no change

Company Workforce

The following questions address changes in the company's human workforce.

Q13. Roughly how many people does the company employ at this time?

1-10
11-50
51-200
201-1,000
1,001 or more

Q14. Did employment numbers change significantly during and/or due to the pandemic?

Yes, decreased significantly
Yes, increased significantly
No change in number of employees

Q15. Were any of the organization's employees able to pivot to remote work?

Yes, full job responsibilities were able to be completed in a remote capacity
Yes, with modified job responsibilities
No, their job requires physical presence in a company facility

Q16. Does your operation rely at all on volunteers for full or partial operation?

Yes
No

Q17. How did you observe or experience changes in employees during the pandemic? Select all that apply.

Ability to come to work for fear of infection
Ability to come to work due to infection
Psychological capacity to complete tasks due to stress
Financial stress or fear of job loss creating stress
Financial changes leading to furloughs and/or layoffs
Other:_____

Product

The following questions address the company's physical product. Product, in this research, is defined as textiles in any stage of the recycling process. These may be pre- or post-consumer or pre- or post-recycling, depending upon your organization and its role in the recycling process.

Q18. What is the incoming "raw material" for your organization?

Unsorted pre-consumer textile waste
Unsorted post-consumer textile waste
Sorted pre-consumer textile waste
Sorted post-consumer textile waste
Any textile waste
Cellulosic/natural fabrics and fibers
Manufactured fabrics and fibers
Other: _____

Q19. What is the outgoing product from your organization?

Unsorted pre-consumer textile waste
Unsorted post-consumer textile waste
Sorted pre-consumer textile waste
Sorted post-consumer textile waste
Any textile waste
Cellulosic/natural fabrics and fibers

Manufactured fabrics and fibers
Other: _____

Q20. In terms of quantity, did product intake change during the pandemic?

Yes, increased product intake
Yes, decreased product intake
No significant change in volume or quantity of product coming into the organization

Q21. In terms of quantity, did product output change during the pandemic?

Yes, increased product intake
Yes, decreased product intake
No significant change in volume or quantity of product exiting the organization

Q22. If there was a change in product processing, what was the most significant?

Product quality
Product quantity
Product volume
Product processing time within the organization

Q23. At any time in the pandemic, was there a discussion or fear of taking in new product due to viral contamination?

Yes, this was a major concern because of the unknowns of viral transmission
Yes, this was a minor concern but never affected business
No

Organizational Structure

Q24. The following questions address the organization's structure during the COVID-19 pandemic.

	Extremely accurate	Moderately accurate	Not accurate at all
Our leader(s) ensured information was shared quickly and efficiently to employees at all levels of the organization.	◯	◯	◯
This organization adheres to a traditional style of one-way, top-down management.	◯	◯	◯
The leader(s) of the organization are a trusted group of professionals.	◯	◯	◯
Significant decisions are made by a single leader in this organization.	◯	◯	◯
In this organization, all employees and their input is considered and valued when making decisions.	◯	◯	◯
Because of our collaborative internal network, sales and/or processing was as fast as or faster than prior, "non-COVID" operations.	◯	◯	◯
In time of trouble or crisis, company decisions were made quickly.	◯	◯	◯
Employees across the organization are familiar with their leader(s) and their leader(s)' responsibilities.	◯	◯	◯
Employees at all levels would professionally describe their coworkers as trustworthy and reliable.	◯	◯	◯
Employees at all levels would describe their professional relationships as transparent and honest.	◯	◯	◯
Throughout the COVID-19 pandemic, the company's structure remained flexible and adaptable to change.	◯	◯	◯

Supply Chain

Q25. The following questions address the business's supply chain during the COVID-19 pandemic.

	Extremely accurate	Moderately accurate	Not accurate at all
Due to changes imparted on the business during COVID-19, our supply flow was redirected.	◯	◯	◯
Due to changes imparted on the business during COVID-19, our supply chain was shifted to meet new demand (incorporating/producing/distributing PPE).	◯	◯	◯
Prior to the pandemic, we housed emergency inventory to fulfill the supply chain during unforeseen changes.	◯	◯	◯
The business would list the following as top priorities during COVID-19: communication, technology, and personnel.	◯	◯	◯
Our priority is simply to keep moving; it has been difficult to define and focus on key areas.	◯	◯	◯
Local or national legislative changes and/or temporary policies made it difficult to maintain our scheduled supply chain (e.g., procurement, transportation, manufacturing, licensing).	◯	◯	◯
Relying on suppliers and/or business partners in our locality was highly sufficient and allowed operations to continue uninterrupted during the pandemic.	◯	◯	◯
Our organization disclosed crisis information and collaborated with supply chain partners for increased mobility, adaptability, and speed.	◯	◯	◯
Our organization shared assets (e.g., warehouse space, distribution centers, transportation partners) with supply chain and industry partners.	◯	◯	◯
Supply chain partners made an effort to maintain relationships while navigating their own pandemic-related challenges.	◯	◯	◯
Business leaders and/or decision makers were key to our supply chain flexibility.	◯	◯	◯

Organizational Culture

Q26. The following questions address company culture during the COVID-19 pandemic.

	Extremely accurate	**Moderately accurate**	**Not accurate at all**
Our organization operates as one network of employees with both shared and individual responsibilities.	◯	◯	◯
There is a hierarchical structure within our organization.	◯	◯	◯
The employees of this organization are trained and knowledgeable within their roles.	◯	◯	◯
The employees of this organization are flexible within their roles and responsibilities.	◯	◯	◯
The employees of this organization all demonstrate leadership skills.	◯	◯	◯
The discourse among employees can be described as more informal than formal.	◯	◯	◯
As the pandemic affected lives inside and outside of the workplace, out employees responded through panic and discord.	◯	◯	◯
As the pandemic affected lives inside and outside of the workplace, our employees responded with collaboration and thoughtfulness.	◯	◯	◯
For our business processes, coordination is valued more than response time.	◯	◯	◯
Our business prefers an informed decision over an immediate one.	◯	◯	◯
Our business landscape proved to be fit and adaptable during the changes inflicted by the pandemic.	◯	◯	◯
Leaders communicated with employees at all levels before drawing decisions that affected them or the business.	◯	◯	◯
Because of emergency preparedness measures taken by the company, employees felt prepared for a crisis or disaster ahead of the pandemic.	◯	◯	◯
The organization demonstrated awareness of vulnerabilities ahead of the pandemic.	◯	◯	◯
This business is designed for efficiency.	◯	◯	◯
This business is designed for responsiveness.	◯	◯	◯

Leadership

Q27. The following questions address company leadership during the COVID-19 pandemic. Please select how accurately the following statements reflect your company.

	Extremely accurate	**Moderately accurate**	**Not accurate at all**
The leader(s) of this organization utilized cooperation for effective communication during business changes and/or announcements.	◯	◯	◯
The leader(s) of this organization ensured a steady flow of information.	◯	◯	◯
Before COVID-19, there was an established crisis management team within the organization.	◯	◯	◯
During COVID-19, a crisis management team was established.	◯	◯	◯
Decision making is centralized to one person or one group of people.	◯	◯	◯
The leader(s) made informed and democratic decisions for the benefit of the company, its consumers, and its employees.	◯	◯	◯
At any point during the pandemic, leader(s) were unreachable or unreliable due to events that occurred in their personal life.	◯	◯	◯

Digitalization and Virtual Communications

Q28. The following questions address the organization's digitalization and virtual communications during the COVID-19 pandemic. Please select how accurately the following statements reflect your company.

	Extremely accurate	Moderately accurate	Not accurate at all
Throughout the pandemic, the organization utilized emergency protocols to communicate to stakeholders, employees, supply chain partners, and consumers.	◯	◯	◯
A crisis-specific online platform was built to share internal information during the pandemic.	◯	◯	◯
The internet is a key asset to our supply chain.	◯	◯	◯
The internet and digital communications allow us to build and maintain trust with consumers.	◯	◯	◯
The internet and digital communications allow us to build and maintain trust with stakeholders.	◯	◯	◯
Computer technology is imperative to processing and sharing our organizational and operational data.	◯	◯	◯
All employees in our organization are technologically proficient.	◯	◯	◯
Some employees are unskilled with technology, but that does not affect or apply to their job performance.	◯	◯	◯

Financial Planning

Q29. The following questions address the organization's financial plans during the COVID-19 pandemic. Please select how accurately the following statements reflect your company.

	Extremely accurate	Moderately accurate	Not accurate at all
The organization experienced financial hardship due to the pandemic.	◯	◯	◯
The organization experienced a drop in product demand and/or need for services during the pandemic.	◯	◯	◯
Prior to COVID-19, the company had a financial contingency plan with appointed leader(s).	◯	◯	◯

Q30. Use this box to include any other information you feel is pertinent to add context to your responses or inform the research from your organization's perspective.

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